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outside of the bends which confine its course. This is brought about by the centrifugal force of the moving water. These two causes are complementary; each aiding the other, and together giving rise to the remarkable shifting in the channels of such streams as the Buffalo River.

THE BRITISH NATIONAL ANTARCTIC EXPEDITION.

BY

PROF. ANGELO HEILPRIN.

The narrative of the British National Antarctic Expedition of 1901-4, which has latterly been given to the world in two sumptuous volumes entitled "*The Voyage of the Discovery*,"* establishes for that expedition a just claim to being considered one of the most successful of all Polar ventures. No earlier voyage of discovery into the icy seas, whether in the north or in the south, has more distinctively accomplished its mission than this one; and none has treated more attractively and satisfyingly of the deeds of its explorers, or given in more graphic form the picture of a long-protracted struggle with nature and of the courage and self-denial which sustained this struggle.

Captain Robert Falcon Scott, R. N., the commander of the expedition, has easily earned the distinctions which have been conferred upon him, for he has not only established a far-reaching Antarctic record in his penetration (on Dec. 30, 1902) to lat. $82^{\circ} 17'$ S.—an advance of nearly 250 miles on his predecessors—but in minor explorations he did much that, wholly apart from the major explorations, would have given a more than reputable standing to the ordinary aspirant for fame. Of such explorations may be cited the survey of the great Ross Barrier to the point of its disappearance in the easterly King Edward VII. Land and the traverse of the lofty snow and ice plateau which, in South Victoria, extends westward from the Admiralty and Prince Albert Mountains, and rises in its bleak and desolate form, the counterpart of the great ice-cap of Greenland, to elevations of 8,000-9,000 feet or more.

Naturally, the chief interest in the narrative centres about the long southern journey and the traverse of the great Antarctic Barrier which bounds the Ross Sea on the south in about lat. 78° S., and so effectually barred the progress of James Clark Ross sixty years earlier. This vast mass of ice, which extends in an

* Charles Scribner's Sons, 1905.

east and west direction for the better part of 350 miles, and which has been assumed by most geologists to represent the terminal or lateral margin of a vast continental glacier, rising in the interior to heights conjectured by some to be 25,000–30,000 feet, is now determined to be an almost perfectly flat expanse of shore-ice or frozen sea-surface—so flat as to make no perceptible rise for the full distance over which it was observed. It was over this ice, following closely the meridional trend of the lofty and clearly-defined mountain ranges of an unmistakable united land-surface (Victoria Land or South Victoria), that the long journey southward was effected. Captain Scott, with much to support his view, believes this flat ice-sheet—which is thought to rest freely on the ocean, and whose front edge (disclosing fairly deep water) has retreated upwards of twenty miles since its existence was made known by Ross—to represent the true contact of the (continental) land and oceanic areas, and with some plausibility argues that this contact-line may extend completely across the polar regions and be followed almost meridionally to Graham Land, to the far south of the extremity of the South American continent. The position and continuousness of the vast mountain ranges, with numerous summits rising above 8,000–10,000 feet, and with a few (Markham, in lat. 83° ; Lister, etc.), attaining 13,000–15,000 feet, and extending unbroken to the farthest point of vision (as observed from lat. $82^{\circ} 17'$), would certainly seem to sustain this view, even if the conditions cannot be held to prove it absolutely.

The “farthest south” of the British expedition, despite the seemingly favourable conditions for its accomplishment that were to be found in the low-lying terrain and a genial and not too high temperature, was attained only after extreme toil and hardship, and through a process which taxed to the utmost the resource and indomitable energy of the commander. No finer exhibition of morale is to be found in the annals of exploration than is disclosed in the narrative of this struggle for the attainment of the unknown, but the cool student of exploration will recognize that just in this struggle is revealed the one weak point of the expedition, and where comparison will fail to sustain for it equality with similar work accomplished elsewhere. The incapacitation of the dog-teams almost with the day of the starting, the breaking in of incipient scurvy, and the reduction of the leader of the party to that degree of mental and physical strain which in the later stages of the journey precluded all interest in the enterprise beyond what touched the cares of the day and the hopes for the morrow, were not the lesson that should have been learned from Mr. Peary’s

brilliant traverses of the inland ice of Greenland. The geographer cannot but deplore the lack of earnest study in the preparation of the details for this phase of the British exploration, for it cannot be doubted that with a sustained dog-team and the proper adjustment of travelling impedimenta a much farther point south would have been attained than that officially recorded and with a much less expenditure of bodily force. The distance travelled on this journey, going and returning, was approximately 750 miles, accomplished in 93 days, or within almost precisely the same period of time in which Mr. Peary accomplished his memorable "white journey," over an incomparably longer course (although comprised within almost exactly the same degree of latitude N.), in 1892. Somewhat more expeditious was the journey over the westerly ice-plateau in the latter part of 1903, when a distance of 300 miles from the ship's quarters, in lat. $77^{\circ} 59' S.$, long. $146^{\circ} 33' E.$, was covered in 34 days, and with a return in 25 days.

Captain Scott corrects numerous misconceptions which prevail regarding the conditions existing in the Antarctic tract. Probably the most interesting, and certainly the most surprising, of these is that which pertains to the accessibility of the region. Since the early explorations of Wilkes and Ross almost to the present day it has been generally assumed that Antarctica was so closely bound in with ice as to render penetration to it a matter of extreme hazard, and expeditions in search of the unknown in that quarter have been looked upon as hardly more than ventures. Even the more or less successful voyages in recent years of Larsen, Borchgrevink, Gerlache, Drygalski, and Nordenskjöld have not prepared us for the statement (although the counterpart of the condition had already been known to exist in Melville Bay, off the N.W. of Greenland) that during any average February "a ship, by coming directly south on the 178th meridian, could reach the Great Barrier without encountering any pack-ice." And further (Vol. II, p. 407): "It is strange to think that there may be a season in the year when the enterprising tourist steamer may show its passengers the lofty smoke-capped form of Mount Erebus as easily as it now does the fine scenery of Spitzbergen."

Geographers will learn with interest that their notions regarding the size of the Antarctic bergs are not wholly accurate. Apparently there are few bergs which exceed a mile and a quarter or a mile and a half in length, or that exceed 200-250 feet in height—a measure which brings them close within the dimensions of the larger tabular bergs of Melville Bay and the North Water off Greenland. In the region explored by the officers of the *Dis-*

covery there would seem to be no individually-differentiated glaciers of the size of the largest of northwest Greenland. A period of recession has been existing for some time, and the morainic material that hangs to the upper mountain slopes shows in some instances a diminution in the thickness of the glacial ice, as compared with a former period, of 2,000–3,000 feet or more. Captain Scott finds no facts to support the conclusion that the recession of the ice-sheets is due to progressive moderation of the climate, or to the incoming of a warm period. The evidence seems clearly to prove that the present period is an extremely cold one—too cold to permit of sufficient precipitation to form glaciers of the larger dimensions which characterized the earlier periods of higher temperature. Numerous facts to support the conclusion that certain glacial periods might be the result of elevated rather than of depressed temperatures might easily be drawn from other regions of the earth's surface, and perhaps most appealingly from Grant and Grinnell Lands in Arctica, where much of the mountain tracts rising to or above 3,000–4,000 feet (Arthur and Garfield Ranges) is, even on the 82nd parallel of latitude, destitute of a snow-covering.

On the home journey, in the spring of 1904, the *Discovery* sailed westward S. W. of the Balleny Islands, on a course that traversed what on some maps appears as the most easterly part of Wilkes Land. No land was here sighted, not even at the point, in long. 154° E., where Cape Hudson should have appeared as a conspicuous landmark. This negative determination can, however, hardly affect the question of the more broadly-determined facts which pertain to the assumed land-masses lying farther westward which were described and pictured by Wilkes. It is earnestly to be wished that some country desirous to add to the fame of its flag, or a generous patron of discovery, may before long despatch an expedition equipped for service along the line that was traversed by Wilkes and for the survey of that still largely unknown area which is comprised between the meridians of 90° and 150° of east longitude.

No very important light is thrown upon the geological construction of the Antarctic regions through the researches of the British National Antarctic Expedition, despite much attention that was paid to geological details. The heavy covering of snow and ice precludes extensive study or examination of rock-masses, and, unfortunately, in the region under examination no determinable fossils were obtained. In this relation, therefore, the region seemingly offers much less than Graham Land and the adjacent island (Seymour Island) and islets, where Larsen and Nordenskjöld ob-

tained the remains of araucarian forests, besides a fair abundance of Jurassic, Cretaceous, and Tertiary (?) molluscan forms—all helping to establish a biologic connection, whether on the land or in the sea, between the faunas of the far south and those of the region lying north of Lat. 55° S.

Space does not permit of more than a reference to the special scientific work of the expedition, which will doubtless be detailed in future monographs by those most competent to treat of the different subjects. Of particular interest among the geological studies are those pertaining to the life histories of the different species of seal and of the emperor penguin. One cannot properly pass over this section of the work without referring to the extraordinary habit which is recorded of one or more species of seal of dragging their bodies, at about the time of impending death, to distances on the inland ice of fifty miles or more and to elevations of 5,000 feet. The geologist and physical geographer can well appreciate at this time what destructive evidence bearing upon land elevations or oceanic transgressions might be obtained from the remains of these sea-animals that are now found so far removed from their natural habitats. In its present climatic aspects Victoria Land may not improperly be compared with the far north of Greenland or with the opposite Ellesmere, Grinnell, and Grant Lands. A mild and genial summer temperature—less mild, however, than in the Arctic tracts—alternates with a winter of extreme severity, and contrasts with the monotonous cold that in more or less continuousness was noted by Nordenskjöld in the region of Graham Land. The lowest official recorded temperature made during the traverse of the lofty plateau was -72° .

The illustrations which accompany Captain Scott's work do full justice to the text, and in themselves would give exceptional value to the report. Few works of travel and discovery have had such support given to them from the camera and photographic process.

GEOGRAPHICAL RECORD.

AFRICA.

THE NILE-RED SEA RAILROAD.—The new railroad across the Nubian Desert, between the Nile and the Red Sea, was opened for business February 17. The line is 331 miles long, and it has cost about \$8,000,000. Construction began at the Red Sea in August, 1903, and the first train passed over the road in October, 1905, the entire work, therefore, occupying only a little over two years. The Red Sea terminus is Port Sudan, 30 miles north of Suakin, to which as a harbour it is much superior.